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Chronic Anorexia in Aquarium Fishes
West Atlantic Corals
Water Motion Devices and Magnetic Powerhead Holders
Digging for Answers

photograph by Jay Hemdal

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Wolf eel, *Anarrhichthys ocellatus*.
Photograph by Jay Hemdal

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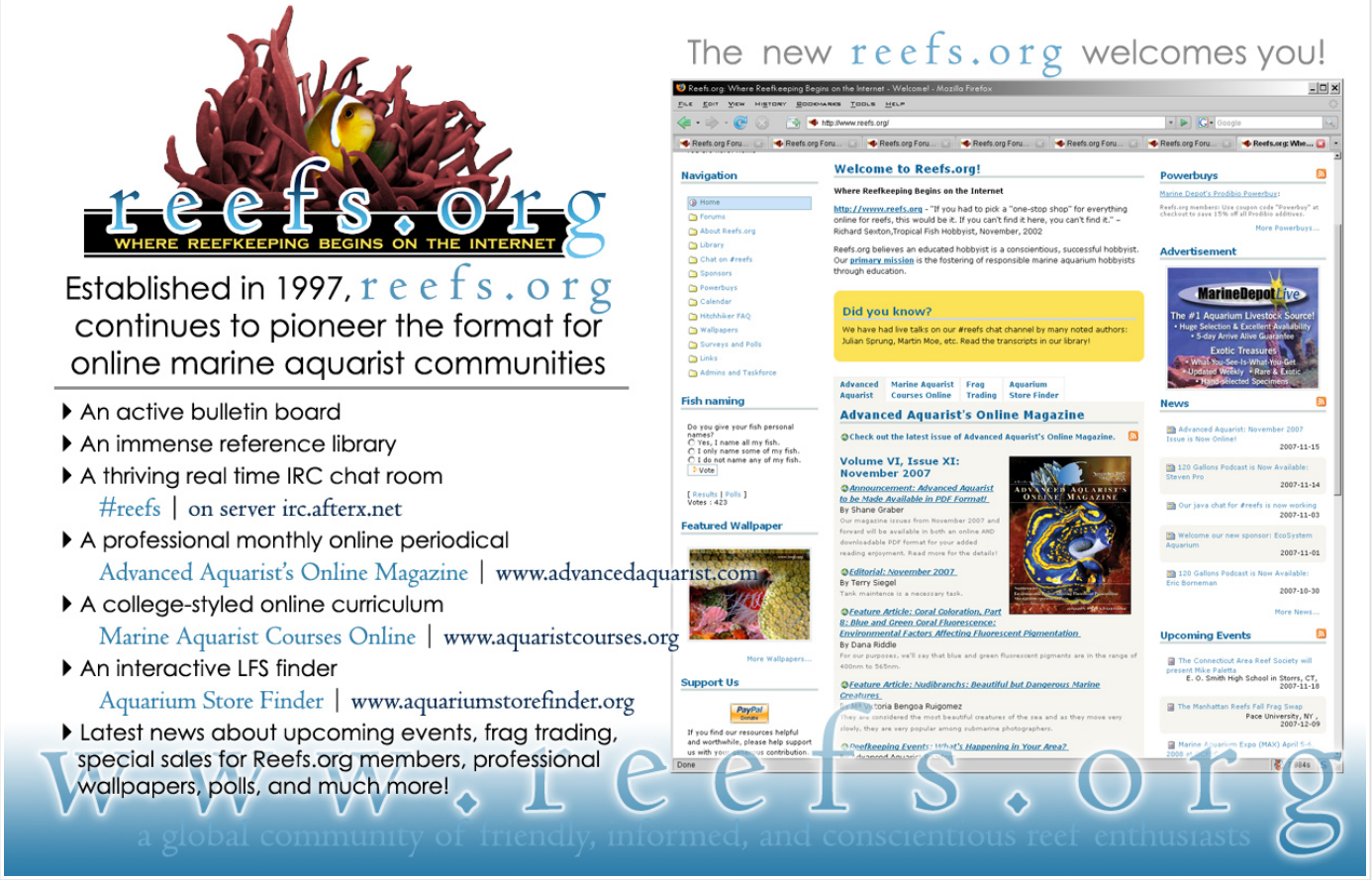
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EDITORIAL

December 2007

By Terry Siegel

We need to protect the planet by using energy and nature wisely. Planet Earth is not inexhaustible.

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Fortunately, people all over planet Earth are becoming increasing aware of the damage that we, as the dominant species, are doing to this planet. Whether we still have time to detoxify what we have made toxic with mindless industrial growth, and to stop global warming before it's too late is a matter of debate. There are some scientists who suspect that we are already past the tipping point. Hopefully, they are wrong. However, I'm not in this editorial going to offer my opinion regarding those responsible for the dilemma that we as a global community are in. I'm interested here in the role we play as aquarists.

We often hear from critics that if we really cared about the environment, specifically the planet's coral reefs, we would not remove into captivity any of its creatures. I don't agree - so long as we do so without damage to the habitat and in a sustainable way we are not damaging the environment. Furthermore, it is aquarists and marine biologists who know and care the most about these creatures. It is we who understand the most about the biochemistry necessary for their survival, and what temperature, UV, and eutropication can do to these beautiful sea creatures. In other words, we know what uncontrolled temperature, pollution, etc can do to a closed system reef tank. In many ways our reef tanks are microcosms of the macrocosm called Earth. Reef keepers recognize how complex the biochemical nature of life on planet Earth is from our struggles to establish and maintain a successful biotope, our reef tanks. In fact, it may ultimately turn out that much of the natural world that we admire will only survive in captivity, and that without our captive specimens their DNA will be lost to future generations, who hopefully will be wiser in maintaining Earth's wild life.

The last point that I want to make has to do with our use of technology with its impact on the global environment, our ability to separate scientific fact from opinion, and how to care for the animals we take into captivity. In this regard, we have come a long way, but still can do much more. Let me be specific.

Keeping a reef tank is very energy demanding. Therefore, we need to use energy as efficiently as possible. Lighting is probably the most energy demanding, and as a result I had high hopes for the new LED fixtures, and still do. However, from what I have read on the boards it appears that there are still cost and production problems to be worked out.

Some of the new high efficiency circulations pumps are a great improvement. By switching away from an 11-amp. Jacuzzi pump to a 3-amp. Sequence Hammerhead pump I saved almost $50.00 monthly and lowered my impact on the environment significantly. Shortening the photo period as much as possible without harming our photosynthetic organisms is a plus for our wallets and the environment. As many already do, swapping coral frags decreases what we take from nature and decreases the energy it takes to ship wild animals. Buying only or mostly tank raised fish is also a plus for similar reasons. By now I think you get the point: we need to protect the planet by using energy and nature wisely. Planet Earth is not inexhaustible.

Achilles Tang from the author's tank.

FEATURE ARTICLE

Chronic Anorexia in Aquarium Fishes

By Jay Hemdal

Don't fall into the trap of assuming the fish will begin feeding when it gets hungry enough, or conclude it must be eating something, just not when you are watching.

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Fish that refuse to feed in captivity is a problem for most aquarists from time to time. Once this difficulty begins with a particular specimen, the clock begins ticking; if the issue is not resolved within an appropriate period, the fish will die. *Acute anorexia* (where a fish suddenly stops feeding, or never starts feeding, and soon dies) is usually caused by some environmental issue; water quality problems, disease, transport stress or tankmate aggression. *Chronic anorexia* is a rarer problem, where the fish has apparently adapted well to captivity in all respects except that it does not show a normal feeding response. The term *anorexia* is replaced with *inanition* (loss of energy due to lack of food) or *inappetance* (lack of appetite) by some authors. In the cases described here, the term *anorexia* is perhaps a better fit as it is defined as "an aversion to food due to serious psychological problems". In some cases, the fish had been feeding well and then stopped for some unknown cause, in other cases, a newly acquired fish refuses to feed despite its apparent environmental needs being met. Weight loss may or may not be apparent in the animal, and inanition is not observed until just before the fish succumbs to the long-term problem. As the following case histories show, some fish have gone without food for extended periods and subsequently recovered. These are mostly older, larger fish, or those kept in temperate (cool) waters. At the other extreme, a post-larval butterflyfish may succumb if it goes even a few days without food.

There is a preferred course of action one should take to try to get a chronically anorexic fish to begin feeding. After the environmental problems mentioned above have all been ruled out, the second, most obvious step in resolving this sort of problem is to make certain that the food being offered is of a type and size known to be accepted by other members of the same species of fish. If the captive diet of the fish is unknown, or if the species is known to be a difficult feeder, the problem may not be just with the one specimen, but rather with the entire species. Assuming that other specimens of the same species are known to feed well on the food being offered, the next step is to change the delivery method. For predatory fish, *stick feeding* will sometimes work to get the fish feeding normally. Simply put, a food item is impaled on the end of a long stick and offered to the fish. However, there is an art to this delivery method. First, different species react in diverse ways to the presence of the feeding stick. Some fish ignore the stick, while others seem to shy away from even the thinnest, least visible of sticks. When in doubt, opt for a clear or very thin feeding stick. It seems that the end of the stick closest to the animal causes the most problem. Using a short length of heavy monofilament fishing line at the end of the stick helps make it less visible to the fish. Avoid wire or other overly stiff material as the fish may strike at the food, but then back away when it touches that material.

The tube-feeding process can be employed to give a fish food energy during the time it is anorexic. In some cases, this gives the aquarist enough time to determine a permanent solution. This process uses simple equipment - a syringe and a flexible plastic tube. Feline urinary catheters or avian tracheal tubes can be used for small fishes (Hemdal 2001). Larger fishes can be fed using standard airline tubing attached to a large syringe. A Luer-lock syringe will hold the feeding tube more securely to the syringe body. It helps with placing the tube if you first bevel the end of the tube. The tube should have marks on it at regular intervals so that you can more easily judge the depth of insertion.

The basic food recipe is to create a liquid that will easily pass through the feeding syringe and tube, but thick enough to carry a high amount of calories to the animal's digestive track with the least amount of water. It is best to prepare this slurry in a blender, using materials that would be components of the fish's normal diet.

The amount of food administered at one feeding is generally 2 to 4% of the animal's body weight, just enough food to cause a slight distension of the animal's belly. (Hemdal 2006). In most cases, the use of an anesthetic such as MS-222 is required to sedate the fish so the tube can be inserted. Holding the fish on its back, gently insert the tube into its mouth and try to locate the esophagus. If you are too far one side or the other, the tube will miss and emerge from under one of the gill covers. Once in place, gentle pressure on the syringe plunger will move the liquid food into the fish's stomach. Once fed, the tube is gently withdrawn and the fish is moved to a recovery tank (Hemdal 2006). Spontaneous regurgitation is the most commonly seen problem, although there are reports of people accidentally rupturing the fish's digestive track. Like any medical procedure, there are subtle techniques for this process that need to be learned through practice - so please do not expect to read this basic introduction and suddenly be proficient at tube-feeding fish.

Force-feeding is a technique that can be employed on larger carnivorous fishes. A sedated fish is held on its back while its mouth is opened. A food item of appropriate size for the animal is then placed in the back of the animal's throat. A finger or

semi-rigid tube is then used to gently push the food item into the stomach. In some species such as anglerfish and eels, there are back-curved vomerine teeth in their throat that will actually grasp the food item and keep the fish from voluntarily regurgitating it.

Be cautious in directly handling a fish during either of these two techniques as some have very sharp teeth, and of course, some fish have venomous spines.

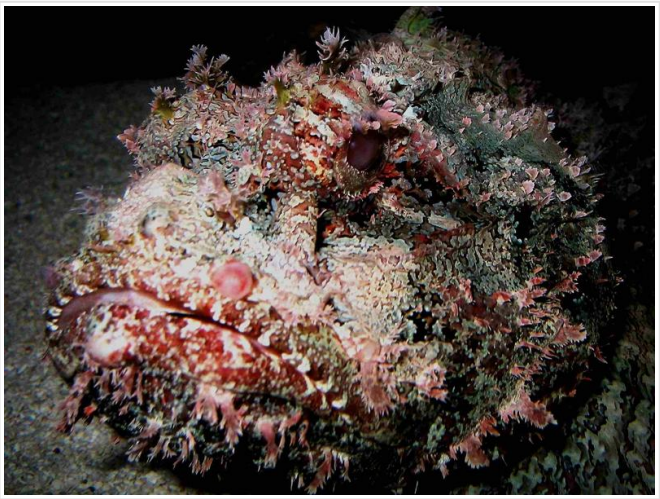
CASE HISTORIES

The following are a series of case histories of long-term anorexia syndrome in aquarium fishes. All of this data was collected from the experiences of various aquarists from around the world (Including some from the author). Please understand that these observations are all subjective, and there may be details lacking that might hinder their application to resolving other cases.

That said, limited (but potentially important) conclusions can be drawn from these case histories. First, in larger fishes, long-term anorexia without concurrent loss of body condition is very often a reversible health issue. Tankmates of the same or similar species sometimes help "train" anorexic fish to feed properly in captivity. While this behavior modeling does not always work, if there are no other compelling reasons a newly collected fish is not feeding, it often turns the tide for a non-feeding fish. When done properly, assisted feeding (force-feeding or tube-feeding) can either "jump-start" an anorexic fish's metabolism, or at least help it maintain body mass until the fish begins feeding on its own. Perseverance and patience are important traits for an aquarist; as long as the fish is not overtly suffering, waiting a bit longer, or trying a different method to offer it food may eventually succeed.

JAPANESE ROUGHY, *GEPHYROBERYX JAPONICUS*

Three deep-sea roughies were imported from Japan. One died due to the stress of shipping, but the other two revived and were held in a quarantine system at 55 degrees F. All manner of prepared foods were offered, both free in the tank and on a feeding stick. Live grass shrimp and *Gambusia* fish were also offered. Neither fish reacted to any of the food items, but would navigate away from the feeding stick with an avoidance response. After one month, the fish were sedated and force-fed once per week, with feeding attempts made during the interim. After two and one half months, the fish were moved into a larger, darker exhibit in the hopes that this would make them feel more comfortable. The force-feeding was discontinued in the hopes that this would further reduce the fish's stress levels, yet the fish both continued to refuse to feed. At the point where it was determined that they were going to need to be euthanized, stick feeding was attempted one final time. By vibrating the food item in front of one fish, a slight feeding response was elicited. Eventually, the fish struck at the food, but missed. Additional feeding attempts were made and soon it was stick-feeding fairly well - fully five months after its arrival at the facility and 2 ½ months since its last force-feeding. The second fish observed the first fish feeding and it soon began stick-feeding as well. Within a month, both fish were feeding on broadcasted food items, and the amount even had to be reduced in order to avoid them over-feeding.



Some adult scorpionfish resist feeding on prepared foods when first collected.

LARGE MORAYS AND WOLF "EELS", *GYMNOMURAENA SP.*, *GYMNOTHORAX SP.*, *MURAENA SP.* AND *ANARRHICHTHYS OCELLATUS*

Reports abound from public aquariums where these eels stop feeding for a week or two to months on end, and then spontaneously resume feeding with no intervention by the aquarist. There does not seem to be any seasonal or temperature relationship with this behavior. Wild-collected zebra moray eels, *Gymnomuraena zebra* are well-known for not feeding well when first brought into captivity. One specimen refused all food for nine months and then spontaneously began feeding on cut up seafoods, and never showed any appreciable loss of body mass. Two newly collected dragon morays, *Enchelycore pardalis* were imported from Japan. Neither would feed and one died within a few weeks. The other one spontaneously began feeding four months after its arrival and is perfectly healthy three years later.

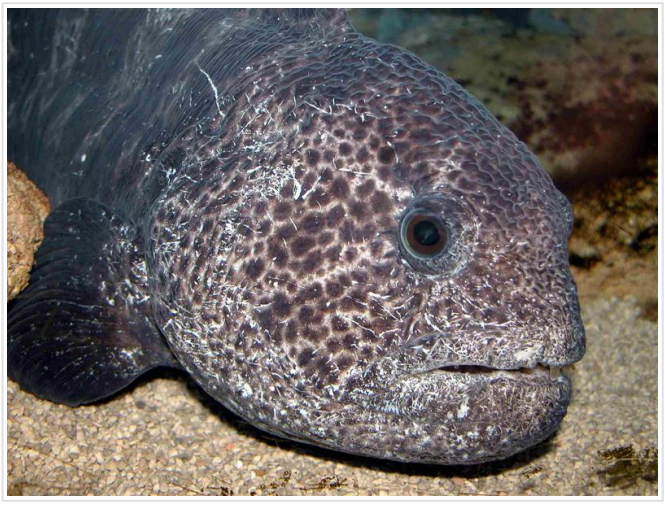
This Japanese roughy was anorexic for months but now begs for food at the surface.

Orange-spotted filefish, *Oxymonacanthus longirostris*

As is typical for this species, the specimen would not feed on any normal aquarium foods until it was offered live colonies of small polyp stony corals. It fed very well on these corals, and even gained body mass. It became anorexic again when isolated from a source of live coral as a food item. This is not an example of chronic anorexia, but rather an inability to properly meet the fish's environmental needs.

Pacu, *Colossoma macropomum*

One specimen was reported to have stopped feeding for approximately four months at a major public aquarium. There was no discernible cause for this. After 12 days of daily tube-feeding, it began to feed on its own again and did not show any further signs of anorexia. Likely, an unidentified environmental factor caused this fish to suddenly stop feeding. In a similar case, a Moorish idol, *Zanclus canescens* had adapted well to captivity when it suddenly stopped eating. A bulge in its posterior abdomen indicated that perhaps the fish had a blockage in its digestive tract. Within a week, the swelling disappeared and the fish resumed normal feeding.



Adult wolf eels often refuse to feed when first collected.

This dragon moray refused food at first but now is doing fine.

Pimelodid catfish, Sorubmimichthys *planiceps*, Pseudoplatystomafasciatum and related species

Large specimens of these catfish in public aquariums have been reported to go on fasts that can last four to six months. Many of these fish would spontaneously begin feeding with no apparent ill effects - and with no indication that they lost much body mass. As these fasting periods do not always coincide with a drop in water temperature, there may be some other seasonal factor involved. One aquarist hypothesizes that these fasts coincide with the long migrations these fish make during the spawning season, where they normally might not be able to feed normally. The same aquarists offers another hypothesis that these fish are so well fed in captivity that they periodically stop feeding because some physiological threshold is reached telling them they are building up too much fat, and must stop feeding.

Pinecone fish, *Monocentris japonicus*

A long term captive that had been feeding normally suddenly stopped feeding. After four months of anorexia, it succumbed. Necropsy results showed a huge amount of belly fat as well as a fatty liver. Freshly collected pinecone fish from Japan have been reported to refuse food for over two months before eventually beginning to feed on their own. Due to their armored bodies, it is difficult to ascertain if they lose body condition during these long fasts.

Red-rimmed batfish, *Platax pinnatus*

A large juvenile specimen was acquired and, as typically seen with this species, refused to feed any offered foods. After being tube-fed a number of times, it began feeding unassisted on live brine shrimp and baby guppies. A few weeks later, it succumbed to a massive external bacterial infection. This may be an example of while tube-feeding can give a fish needed food energy, the process itself can be stressful and the constant handling can damage the delicate skin leave a fish open to bacterial infections.

Saddleback butterflyfish, *Chaetodon ephippium*

A very large adult specimen was acquired, but refused all foods for four months in captivity. The fish did not seem to lose significant body mass during this period, and its behavior was normal in all other respects. It spontaneously began feeding on food items that had been previously offered and ended up living for a normal length of time.

Smooth butterfly ray, *Gymnura micrura*

Acquired as a sub-adult, the ray refused to feed unassisted for one month and was tube-fed for approximately five weeks until it eventually succumbed to physical damage caused by handling during multiple force-feeding events.

Snowflake moray, *Echidna nebulosa*

A juvenile specimen was feeding well, but then stopped feeding for seven months after jumping out of the aquarium and being

found partially desiccated on the floor. It eventually began feeding, but then died one week later. This may have involved liver damage from the extended starvation. This fish did show severe emaciation and probably should have been euthanized, although force-feeding might have helped.

Stonefish, *Synanceia verrucosa*

A large adult specimen was wild-collected and transported to a public aquarium. It refused to feed for over 9 months, even when placed in an aquarium with other stonefish that were feeding normally. It did not appear to lose much body mass during this lengthy fast. One day it suddenly began eating food that had previously been offered, and ate normally after that time.

Tarpon, *Megalops atlanticus*

This species is typically only maintained by public aquariums, however pond raised juveniles have been made available to the pet trade (although highly inadvisably due to their huge maximum size (over 350 pounds)). Adult tarpon have been reported to cease feeding for months at a time with no apparent ill affect. Some of these cases seem correlated to lower water temperature during the wintertime, and may be a normal seasonal behavior for this species. A rise in water temperature, or a few months passage of time always seems to result in the tarpon's eventual resumption of normal feeding.

Conclusion

Be sure to evaluate a non-feeding fish right away and take steps to resolve any environmental problems. Don't fall into the trap of assuming the fish will begin feeding when it gets hungry enough, or conclude it must be eating something, just not when you are watching. A fish that does not actively pursue and consume food that you offer it is going to have problems surviving for the long term.

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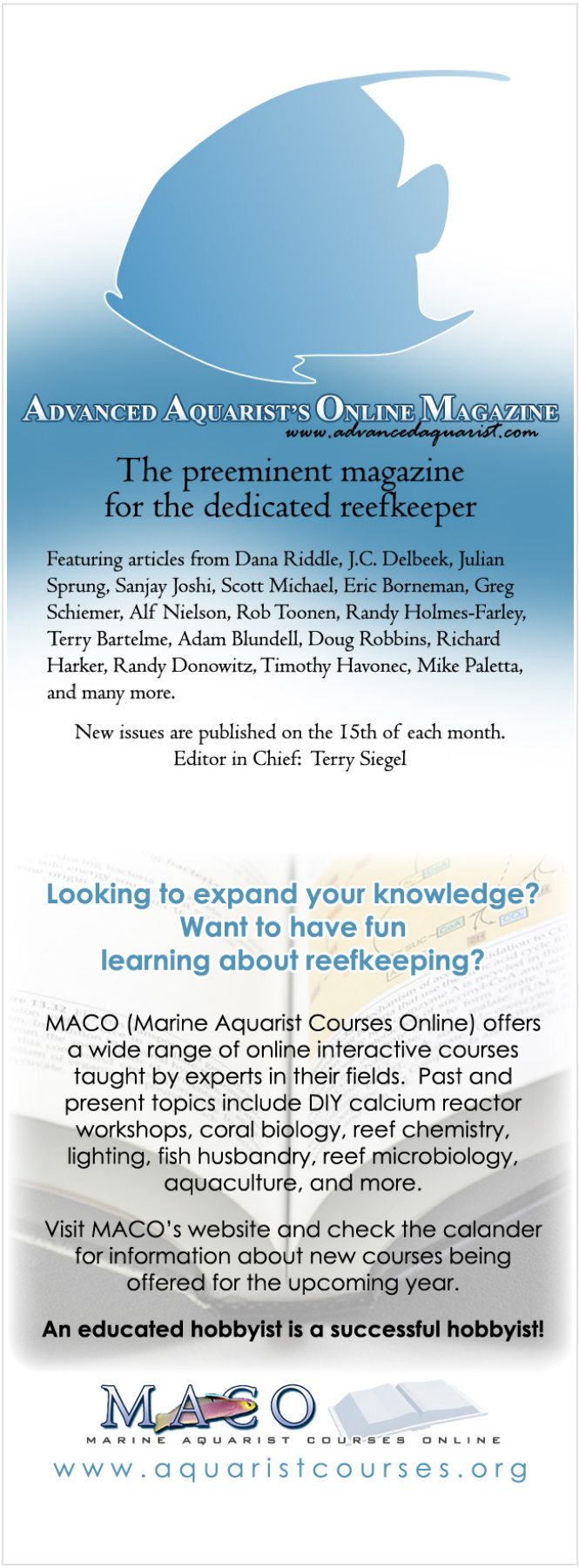
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FEATURE ARTICLE

Tropical West Atlantic Corals, Part 1: General Information and Atlantic SPS Corals

By Jake Adams

By illustrating West Atlantic corals through close-up photography and relating the species to well-known Pacific species, this article introduces West Atlantic corals in a perspective which is familiar and informative for aquarists as well as divers.

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Through its personal, day-to-day interactions with coral, the reef aquarium community as a whole has learned a lot about reef-building corals. However, since West Atlantic stony corals have been banned from collecting for the ornamental trade, most of the coral which is distributed through the aquarium trade originates from the Indo-Pacific region. Due to this collection disparity, aquarists in general aquarists know much less about the stony corals of the West Atlantic, including many of the unique endemic species. Furthermore, many marine aquarium books omit information about corals which are unavailable in the trade resulting in an even greater gap in our knowledge of West Atlantic corals. This is particularly disappointing for American reef keepers who know more about corals from seas and islands they will never visit than the corals which grow in U.S. territorial waters. Furthermore, the literature which does cover West Atlantic corals is usually written for divers and naturalists. These texts often discuss and present corals from a point of view which has little relevance for aquarists. By illustrating West Atlantic corals through close-up photography and relating the species to well-known Pacific species, this article introduces West Atlantic corals in a perspective which is familiar and informative for aquarists as well as divers.

Geography of the Caribbean Sea

The diversity of stony corals and the types of reef development in the Caribbean Sea can loosely be categorized into major geographic zones. These zones are designated by their climate, oceanography and their geography. The west coast of Florida and the Gulf of Mexico support reasonably good coral diversity. Since these reefs frequently experience strong storms, the coral cover is only moderate compared to other Caribbean reefs. Southeast of Florida, the Bahamas Archipelago contains an estimated 3000 islands which provide for heterogeneity of reef types, even on different sides of the same island. Northern shores are subjected to the force of the Atlantic Ocean whereas southern shores facing the Caribbean Sea are relatively sheltered from the swell of the open ocean. Below the Bahamas, the Antilles are an island chain stretching from Cuba in the West to Trinidad and Tobago in the East. The first few islands in the chain are known as the Greater Antilles and they include Cuba, Haiti and the Dominican Republic and Puerto Rico. The remaining smaller islands are known as the Lesser Antilles. As with the Bahamas, the northern shores of the Antilles are steeper and more exposed than the shallow southern shores which support better reef formation. The Greater Antilles support better coral growth than the Lesser Antilles with the exception of Aruba, Bonaire and Curacao which occur below the Hurricane Belt. Reef development is hindered on South American coastlines due to a large influx of freshwater but on Central American Coastlines, coral reefs thrive. The reefs of Panama are well developed and the Gulf of Honduras contains the Belize Barrier Reef System which is the longest barrier reef in the Caribbean Sea.

Caribbean corals clockwise from top left: Acropora palmata, Montastrea cavernosa, Colpophyllia natans, Mycetophyllia ferox.

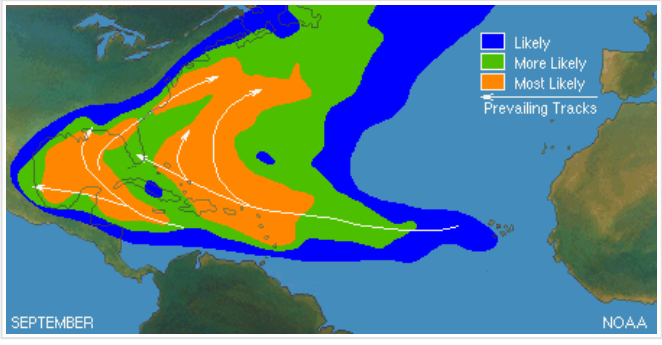
The Hurricane Belt

One of the major forces shaping the way reefs form in the Caribbean is known as the hurricane belt. The occurrence of hurricanes has a strong impact on the formation of reefs in terms of shallow water coral cover and coral diversity (Rogers 1993). As tropical storms move westward through the Caribbean Sea, they are barred from moving southward by a ridge of high atmospheric pressure which is generally agreed to occur near 12.5 degrees North. Reef areas in the path of the hurricane belt experience more frequent and more severe tropical storms. The increased damage to reef-building corals in this area leads to less coral cover but it fosters a greater diversity of shallow water corals. Reef areas outside of the hurricane belt experience fewer and less severe tropical storms. The reduced damage allows corals to grow larger and to cover more of the reef but it also enables more competitive corals to dominate, resulting in a decrease in the diversity of shallow water corals.

Diversity and Taxonomy

The Caribbean Sea is home to over 70 species of corals which are distributed in 20 genera and 14 families. All of the coral species and nearly half of the genera are endemic to the Caribbean Sea. Until very recently, it was believed that all Atlantic stony coral species belonged to families which also occurred in the Pacific Ocean. Classic taxonomic tools have relied primarily upon making distinctions between a coral's form and function or its morphology to determine its relation to other coral species. More modern taxonomic tools employ a variety of techniques including a growing emphasis being placed on genetic markers to differentiate between corals at all levels of taxonomy. Recent research using genetic markers has shown that certain Caribbean coral species which were once believed to belong to families also common to the Pacific are actually more closely related to each other in the first coral family to be endemic to the Caribbean Sea (Fukami et al. 2004).

Map of the West Atlantic including the major geographic zones. Tim G. Richardson.



Typical North Atlantic Tropical Cyclone Formation in September. NOAA.

Conservation

Before we dive in to the eye candy portion of this article, it is our responsibility to understand some of the forces which are threatening the ecology of Caribbean reefs and the diversity and abundance of Caribbean corals. The causes for the decline in coral cover in the Caribbean are many and research is just beginning to understand some of these causes, many of which have links to human activities on land and in the sea. One of the most alarming causes of coral mortality is disease which in some cases has been shown to be aggravated and sometimes directly attributable to human sewage (Patterson et. Al 2002). Coastal development in many regions has led to increased erosion and with it, an influx of nutrient and sediment in coastal waters. The increased nutrients fuel algae growth and the sediments can irritate and kill coral (Rogers 1990). Furthermore, the depletion of predatory fish species by commercial and recreational fishermen has allowed damselfish population to grow unchecked. Since damselfish scrape away coral tissue to grow algae farms, their increased numbers lead to an increase in the loss of coral cover (Potts 1997). In many respects, Western society is often more concerned about the future of exotic ecosystems when our own natural resources are greatly imperiled. In North America, this is especially true of aquatic resources where over a third of 300 endemic freshwater mussel species are threatened or in need of conservation status (Neves 1993). Although it is noble and worthy to protect ecosystems with a high biodiversity of species, there is ample room for an increased awareness of the threats to our own local ecosystems.

Acropora cervicornis close-up.

SPS: ACROPORA

There are hundreds of *Acropora* species in the Indian and Pacific Oceans but the genus is represented by only two species in the Caribbean Sea. *A. cervicornis* is called staghorn coral and *A. palmata* is called elkhorn coral. For a time it was believed that *A. prolifera* was a third species but recent research has shown that this coral is actually a hybrid of the two true *Acropora* species (Oppen et Al 2000). *Acropora* are important reef building corals for Caribbean reefs but their sharp decline in abundance and susceptibility to disease has warranted their placement on the endangered species list.

*Acropora cervicornis*is an important habitat for coral reef fish. The colonies grow into a staghorn shape with golden brown branches and sharp white tips. The branches are pretty robust but they are prone to breaking which facilitates asexual propagation. Due to the effects of the hurricane belt, extensive stands of *A. cervicornis* are most common in southern Carribean locations such as Roatan, Curacao and the Grand Cayman Islands.

A dense growth of A. cervicornis growing in Curacao. These types of monotypic stands can only develop where strong storms are infrequent. Aldo Croquer.

Acropora palmata is commonly known as Elkhorn coral because its colonies are composed of thick, broad branches. This coral can grow to produce some of the largest colonies of all corals. Elkhorn coral is critical in building reefs because it grows quickly and it produces a sturdy reef structure. Although entire reef zones formerly consisted almost entirely of *A. palmata*, in recent years this species has declined by 80-95% of its former population abundance throughout much of its range (Gladfelter 1991). *A. palmata* occurs almost exclusively in very shallow, high energy environments.

An isolated and very large colony of Acropora palmata growing in a fore reef.

AGARICIA

To the seasoned aquarist, *Agaricia* will resemble commonly kept *Pavona* species as well as other Pacific genera belonging to the family Agariciidae. *Agaricia* is endemic to West Atlantic reefs and the seven recognized species occur on reefs at all depths. The colonies are usually encrusting, submassive or foliaceous. The corallites are small and closely set with shared walls and visible septa which radiate from the coral calices. The species are

The typical appearance of a medium sized A. cervicornis colony.

Close view of the lead growing edge of Acropora palmata

distinguished partially by the degree of ridge development between the corallites. Light brown and grey are the most common colors of *Agaricia* but the genus also occur in yellow, green, orange and shades of purple and bluish grey.

Agaricia agaricites is a highly variable species which grows into several recognized forms. Depending on the environment, colonies can grow encrusting or sub-massive (agaricites), plating or foliaceous (purpurea), thick bifacial plates (carinata) or upright bifacial lobes (danai). The surface has well developed intersecting ridges which give this coral a reticulated appearance. *A. agaricites* is usually colored a light golden or dark brown, sometimes with a pale growing margin. This species superficially resembles *Gardinoseris* from the Pacific.

Agaricia humilis is a somewhat cryptic species which rarely grows very large. Colonies are encrusting with closely spaced small corallites. The well developed ridges intersect frequently around the corallites making them appear deep and dark. The color is usually dark brown but it can also be shades of green and orange.

Agaricia tenuifolia is an important reef-building coral species.

This A. agaricites has well developed intersecting ridges which give it a reticulated appearance.

A. humilis usually grows in protected crevices and underneath ledges of relatively shallow reefs.

Agaricia fragilis usually grows into small disc shaped colonies. The surface is very smooth with weak development of ridges. The outer growing edge frequently has a pale margin which fluoresces a brilliant green or orange. It most commonly occurs in sheltered reef areas at intermediate to great depths. It somewhat resembles certain Pacific *Leptoseris* species.

Agaricia lamarcki is a foliaceous species which can grow very large in the right environment. The colonies are usually found at intermediate depths and they frequently will develop into sheets and whorls. The surface of *A. lamarcki* colonies has a moderate development of ridges. The most notable feature of this species is the characteristic star-like pattern around each corallite which can be golden, white or blue.

The form of A. agaricites which is bifacial and grows upright is sometimes called 'A. carinata'.

Agaricia humilis has small deep corallites, giving it a pock-marked appearance.

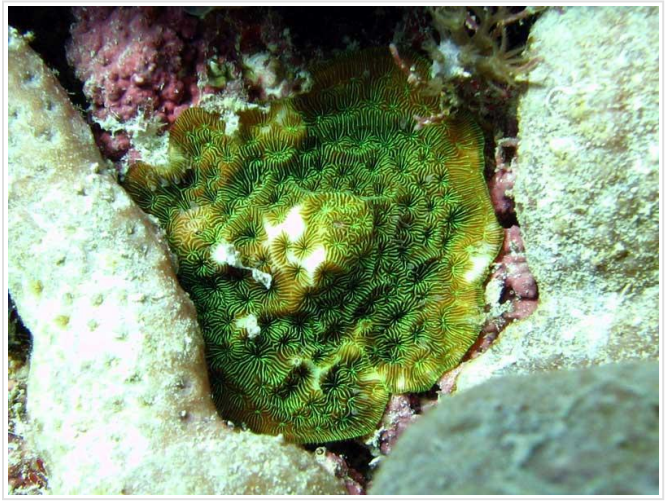
Agaricia tenuifolia is a fast growing coral species which is an important contributor to the reef-building process. *A. tenuifolia* can grow very large and it frequently becomes the dominant species in certain high energy reef zones. The colonies are composed of thin upright bifacial plates with strongly developed grooves running parallel to each other and the growing edge. The color is a uniform light brown or grey with thin pale lines between the corallites. *Agaricia tenuifolia* is most common in shallow reef zones with strong regular wave action.

Agaricia tenuifolia has very strong ridge development.

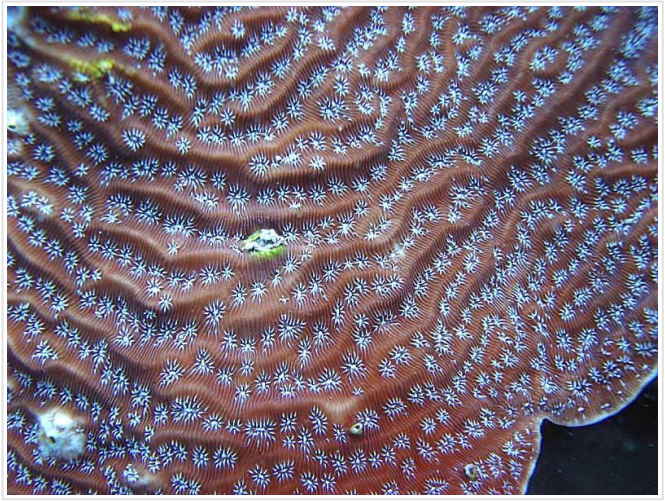
PORITES

Porites is a genera which is common in the Pacific Ocean as well as modern reef aquaria. The five currently recognized Atlantic *Porites* species grow colonies which are massive, plating, encrusting or branching. The branching species can be very abundant in shallow protected waters whereas massive *Porites* is more common in shallow exposed reef areas. At just a millimeter across, the corallites are very small and they are closely spaced giving the skeleton a porous appearance. Colors are frequently

Agaricia fragilis has a very smooth appearance. Take notice of the brilliant glowing edge on this specimen.



This brilliant green Agaricia species was growing under a ledge in shallow water.



Agaricia lamarcki has moderately developed grooves and a characteristic star-like pattern around each corallite.

This deeper water Agaricia specimen is a beautiful orange color, not unlike orange Pavona maldivensis.

yellow, brown or grey but some species occur in vivid red, pink and blue. *Porites* species appear very smooth when the polyps are retracted or they can appear fuzzy if the polyps are extended.

Porites astreoides is a common and highly visible coral on Caribbean reefs. It is most often vivid yellow or yellowish-green but it can also occur in grey and brown. In shallow water with strong water motion *P. astreoides* has a mostly encrusting growth form. At intermediate depth this species takes on a more typical dome or rounded ball shape with large lumps covering the surface. On deeper reefs the colonies can become plating but they usually retain the lumpy appearance on the colony surface.

Porites divaricata is one of the less abundant *Porites* species in the Atlantic. Although it can be found in a range of habitats, it occurs at relatively low densities. It is the thinnest branching species of the Atlantic *Porites* and its delicate branches are prone to breaking. In calmer back reef areas it can develop into small patches but it is most often encountered as a loose aggregation of unconnected branches. *P. divaricata* occurs in grey, brown and greenish but it will sometimes be a vivid red, blue or purple, usually with bright white or yellow branch tips. This species superficially resembles *Montipora digitata.*

P. astreoides growing at intermediate depth.

This is a grey specimen of P. astreoides which is growing into the plating form more common at greater depths.

Porites furcata occurs almost exclusively in very shallow water. It commonly grows up to the water surface in moderate wave action, in lagoons and backreefs. Of the branching *Porites* species, *P furcata* has medium sized branches which bifurcate frequently. The colonies of *P. furcata* provide very high quality habitat for a variety of small fish and invertebrates.

Porites porites has the thickest branches of all the Atlantic Porites species. This coral's branches have a somewhat enlarged appearance at the tips. The polyps can extend to a great degree making the branches appear fuzzy. *P. porites* occurs at all depths but it is the most common species in intermediate to deep reefs. The color is uniformly grey.

The next article will continue the coverage of West Atlantic SPS corals and it will also cover the diverse coral species in the Faviid family.

Porites divaricata has the thinnest branches of all the Atlantic Porites species.

Porites divaricata at intermediate depth.

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Porites furcata growing just below the water surface.

Porites porites has thinner and more widely spaced branches at depth.

The three branching Porites species found in the Atlantic, from left to right; P. divaricata, P. furcata, P. porites

REEFKEEPING EVENTS

WHAT'S HAPPENING IN YOUR AREA?

By Advanced Aquarist Readers

Check to see if an event is happening in your area!

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Link to original article: http://www.advancedaquarist.com/2007/12/events

DO YOU HAVE AN UPCOMING EVENT?

If so, please email us at feedback@advancedaquarist.com and let us know about it and we will include it in next month's Reefkeeping Events column!

2008 SOUTHWESTERN CORAL FARMERS MARKET THIRD ANNUAL EVENT

Date: Sunday, February 24th, 2008
Time: 10:30 AM to 4 PM
Location: Hilton Ontario Airport Hotel, 700 North Haven Avenue, Ontario, California 91764
Website: http://www.sw-cfm.com/

This 2008 Coral Farmers Market sanctioned event is the third annual event run by the SouthWestern Coral Farmers Market company. We now have confirmed reservations for 35 coral farming and exhibiting vendors who will be selling or displaying their captive grown, cultured corals or reef related products to the public. This is scheduled to be the largest Coral Farmers Market event to date. This will also be one of the largest displays of the absolute best exotic captive grown corals ever presented to the buying public. We expect at least 400 total attendees.

Some of the best coral farming vendors from Southern California, the states of Utah, Nevada and Arizona along with farmers from the California Bay Area and Sacramento will be setting up coral displays. Farmers include aquarists, retail reef shops, online coral shops and full scale coral farming enterprises. There will also be exhibitors present who will be demonstrating and selling their products. This SW-CFM event will also feature coral auctions, raffles and door prizes throughout the day. Reef aquarists new to the captive reef market can also expect to see a fine collection of easy to keep beginner corals. For the first time in a Coral Farmers Market event we will also have a Marine Fish Hatchery company exhibiting and selling captive bred marine fish. Aquarists and enthusiasts can attend this one-day event by purchasing a SouthWestern Coral Farmers Market day ticket online for ($15) up to 4 weeks prior to the event. Within 4 weeks of the event the online ticket prices will be ($25). Tickets will also be sold at the door ($30) during the day of the event, but may be limited by occupancy restrictions. We are also encouraging our farmers to bring plently of farmed soft corals along with their usual excellent farmed stony corals.

MIDWEST FRAG FEST

Date: May 3-4, 2008
Time: Saturday (9 AM - 5 PM), Banquette @ 6 PM; Sunday (9 AM - 2 PM), raffle 3 PM
Location: Clock Tower Resort and Conference Center, 7801 E State Street, Rockford, IL 61108-2721, US
Website: http://midwestfragfest.com/index.html

Midwest Frag Fest is the premier coral conference across the midwest. Frag Fest 2008 will be held on May 3rd and 4th at the Clock Tower Resort and Conference Center located just off of I-90 in Rockford IL. Our goal is not only to provide both hobbyists and vendors across the region with the best experience at an event of this type, but to donate a portion of the proceeds towards reef conservation and also give back to the community. Admission will be discounted with the donation of canned goods for a local food pantry.

Attendee information:

- Hotel accommodations are available at a reduced rate at the Clock Tower Resort for only $94 per night.
- Full event pass includes admission to all speakers, trade show and frag area, banquet dinner, and event T-shirt . The cost is $55. Sign up fast. First 40 to register will sit at a speakers table at the banquet. What a wonderful opportunity to chat with the pros

One day pass with all access for that days events are available as follows:

- Saturday with dinner $45
- Saturday with out dinner $20
- Sunday $20
- Trade show, fragging area only $10
- All at the door admissions reduced by $1 per can good donated up to $5 off

Speakers include Adam Blundell, Rod Buehler, James Fatherree, Mike Paletta, Gary Parr, Steven Pro, and Randy Reed

The 24th Annual Raleigh Aquarium Society Workshop and Auction

Dates: Friday, February 29th - Sunday, March 2, 2008
Location: NC State Centennial Campus, Engineering Building 1, 911 Partner's Way, Raleigh, NC 27606
Website: http://raleighaquariumsociety.org/main.html

Please note that this is a different location from years past. Here is the schedule:

Friday: The native fish collecting trip will be during the day and our Marine Aquarium presentations will be that night. So far we know we have Brian Plankis of Project DIBS speaking and we are in the process of confirming our second speaker. There will also likely be a frag swap and fragging demonstrations that night. More details will follow.

Saturday: Saturday will include several freshwater fish and plant presentations as well as some general presentations which pertain to both freshwater and marine aquaria. More details will follow.

Sunday: This is our annual auction of fish, plants, corals, inverts, dry goods, tanks, and anything else aquarium related. Anyone is welcome to buy or sell. A portion of all proceeds go to benefit The Raleigh Aquarium Society and costs related to the workshop.

More details will follow. If anyone has any questions about the Workshop, please feel free to e-mail carmiejo@hotmail.com or Ltwaddle@yahoo.com.

Marine Aquarium Expo, Saturday, April 5 and 6, 2008

The First Annual Marine Aquarium Expo (MAX) is a TWO DAY EVENT at the Orange County Fair & Exposition Center (Costa Mesa, CA) April 5-6 2008!

Dates and Times:

- Saturday, April 5th 12:00 noon to 8:00 PM
- Sunday, April 6th 10:00 AM to 6:00 PM

Event Information:

- Over 100 exhibitor's booths!
- Manufacturers, Wholesalers, Retailers, Exhibitors
- Livegoods/Drygoods for sale throughout the building
- 8 major Speakers lined up! (4 per day)
- Multiple Workshops and Demonstrations
- Children's Petting Pool and education area (pending)
- Frags! Frags! and more Frags! need I say more?

Admission: Adults $10.00, Seniors $5.00, Children 12 & under are Free!

MAX is held in Building #12, (22,000 sq. ft. fully-enclosed, air-conditioned exhibit hall). An adjoining 7,000 sq ft. covered courtyard will host much of the peripheral activities (speakers, workshops, raffles, seating area, etc.). This greatly enhances the space available inside building 12 for commerce. In other words: More room for everyone!

HUGE RAFFLE at the end of each day! Special Note: 50% of ALL Raffle Proceeds will go to 10 select public charities, all of whom are participating in MAX either directly or indirectly. (some represented by hobbyists doing a workshop on behalf of the charity)

This is a VERY family-oriented event, so please plan on bringing the entire family for a weekend of spectacular exhibits, speakers, workshops, displays, and other entertainment. Great food, clean restrooms, even a seating area.

Ladies and Gentlemen, this event is expected to attract over 3,000 hobbyist from all over the United States! Participating vendors and attendees alike are coming from all parts of the country. In fact, MAX is soon to become the largest event of its

kind in the entire North American continent in terms of overall attendance. You don't want to miss this one!

For more information, visit us at: http://www.marineaquariumexpo.com

Contact Information:

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"Marine Aquarium Expo 2008"
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(714) 530-1094 office / (714) 260-6660 cell

International Marine Aquarium Conference '08, May 30-June 1, 2008

At the International Marine Aquarium Conference the speakers will be covering all the latest information and research on marine aquarium fish, corals and invertebrates. Meet with them socially, see exhibits by some of the foremost manufacturers and dealers in the aquarium hobby, and get some great deals on conference specials.

IMAC is open to ALL hobbyists . You do not have to belong to a marine aquarium society or even own a reef tank to attend, just be interested in learning more about this fascinating hobby. IMAC is a non-profit venture by hobbyists for hobbyists to insure the continuation of an annual educational event for aquarists, at a reasonable cost.

Whether you are a seasoned aquarist or just a beginner, IMAC is something you need to take in. And IMAC is put on each year by the same people, so if you attended IMAC in 2003, 2004, 2005, 2006 or 2007 you know the high quality of the show that we will put on.

IMAC 2008 will take place in Chicago, Illinois, USA - May 30, 31 and June 1 at the Crowne Plaza Hotel, Chicago IL:

Crowne Plaza Hotel, Chicago O'Hare
5440 North River Road
Rosemont, IL 60018, USA

For more information, visit http://theimac.org/ or contact Dennis Gallagher.

MACNA XX, September 5-7, 2008

Presented by Atlanta Reef Club and MASNA, MACNA is the largest hobbyist marine conference in North America. New aquarium products, vendors will often wait until MACNA to release new products into the hobby. Hobby professionals, you will have a chance to meet and mingle with professionals in the hobby like Eric Borneman and Anthony Calfo. A chance to be at a conference with hundreds of other people just as obsessed with aquariums as you are.

We have selected the Westin Peachtree Plaza as the host hotel for this event. It is the tallest hotel in the western hemisphere. Our negotiated room rate is $119.00 per night with discounted parking. Everyone that stays in the hotel will be given free internet access from their rooms.

This 73-story tower, topped by the revolving Sun Dial Restaurant, Bar & View, graces the heart of Atlanta. Connected to AmericasMart, The Westin Peachtree Plaza, is steps from CNN, Georgia Aquarium, Georgia World Congress Center and the Georgia Dome.

Contact Information:

MACNA XX
1266 West Paces Ferry Rd.
Suite 194
Atlanta, GA 30327
E-mail: info@macnaxx.com

Want to see your ideas in print?

Advanced Aquarist wants to hear from you!

Do you have a marine-related topic that you'd like to share with others or that you think the marine aquarium hobby might be interested in? If so, why not write for us? We offer very competitive pay rates and your article will be published both online and in PDF for others to read.

Contact our Chief Editor, Terry Siegel, at terry@advancedaquarist.com and get started!

LATERAL LINES

DIGGING FOR ANSWERS

By Adam Blundell M.S.

You may not think that learning about fossils will help you as an aquarist. Indeed you may be correct. But it will certainly help you in understanding the great history behind those colorful little fishes sitting in your living room aquarium.

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What is today is a reflection of what was yesterday.

If you spend enough time in this hobby you are sure to have several of those conversations. The conversations that explore the greater diversity of fishes and their evolutionary history. I'm still dumbfounded on how the fishes have evolved. They inhabit nearly all areas of the Earth. Keeping in mind that the Earth is roughly 70% covered in saltwater (an average depth of several thousand feet), and only 0.036 percent of the planet's water is in rivers and lakes. (reviewed on howstuffworks 2007) Yet around 10,000 species of fishes are freshwater fishes… about half of all fish species.

While I may never understand this, I certainly appreciate all the informative discussions I've had with friends over the years. This article is dedicated to those who have helped me to see the bigger picture.

RECENT EXPEDITIONS

Fellow author and lecturer James Fatherree recently spurred on a fossil digging exercise. I was fortunate enough to join in on this trip to the desert. And what a trip it was. Imagine taking a bunch of fish geeks out on an all day trip to dig in the dirt. It was even better than that.

Attending this trip were people all involved with a hobbyist club, but also involved in many other areas. It included: James Fatherree (author/lecturer), Adam Blundell (Aquatic & Terrestrial Research), Jake Pehrson (Coral Planet), Shane Silcox (Desert Reef Aquatics), and Will Spencer (Wasatch Marine Aquarium Society). The plan was to dig up as many prehistoric fossils as you could. This was the easy part. We found hundreds, honestly hundreds of fossils. The second goal was to carefully remove these fossils from the surrounding rock… this is where we failed. In case you were wondering fossils that are 500 million years old (mid-Cambrian) are simply put; very old. They break easy. It is frustrating. Get over it.

The fossils we found (and were looking for) are called Trilobites. Trilobites are now extinct but there were marine invertebrates living in huge numbers in ancient oceans. And yes, these marine fossils are now located 1,000 miles from the nearest ocean. Proof once again that the Earth itself is in fact alive and ever changing.

FOSSIL DIVERSITY

Not far from the House Range location of Trilobites you can find the Fossil Butte area. Seperated by maybe 500 miles… and 400 million years of evolution. Yes, a 500 mile drive will take you to an area of great fossil abundance but over 400 million years different in age (Eocene era). What is more interesting, these Eocene era fossils are in fact freshwater. And while driving that 500 miles you'll cross over the remains of hundreds of dinosaur fossils. In deed this great land of ours is filled with amazing

fossils; unfortunately they are just below the surface and therefore out of our daily sight.

Now as a way of confusing hobbyists even more I'll point out that marine Trilobites are found in the Western United States... as well as Spain. Indeed once again we see how the world has changed and how marine life has lived for eons. Please take some time to learn about the history of life outside your front door. There is a lot of history out there worth finding.

Shown here a few of the participants digging away.

Preparing Fossils

The first step in preparing fossils is to find fossils. This can be an all day affair of digging for nothing in return. Thankfully some commercial operations exist and some well traveled public areas that are nearly sure fire for finding fossils.

The second step is to remove as much of the surrounding substrate as possible. I'll give you my warning that this is the most difficult step. I've ruined several fossils because honestly I'm not too good at this step.

The third step is the fine cleaning stage. Some people use a toothbrush or cloth to clean off delicate areas. Some fossils are stained with a solution to help differentiate the fossil material from the surrounding strata. Whatever type of fine cleaning you use, I highly recommend practicing first. Nothing is worse than investing 100 hours to clean a fossil, only to ruin it at this stage. When it doubt, don't do it. I like to use water and a toothbrush, but that is all I risk using at this stage.

Finally it is time for the fossil to find its new home. And of course some fossils are put in display cases while others end up in a storage closet.

This photograph show the shale rock which can be splintered to find the fossils.

Also, continents apart you can find trilobites of varying forms and sizes.

Conclusion

I would like to thank James Fatherree for being the catalyst in this article. I appreciate his friendship and his enthusiasm for prehistoric aquatic life. I encourage all readers to investigate the fossils found in their neck of the woods. You may not think that learning about fossils will help you as an aquarist. Indeed you may be correct. But it will certainly help you in understanding the great history behind those colorful little fishes sitting in your living room aquarium.

Author Information

Adam Blundell M.S. works in Marine Ecology, and in Pathology for the University of Utah. He is also Director of The Aquatic & Terrestrial Research Team, a group which utilizes research projects to bring together hobbyists and scientists. His vision is to see this type of collaboration lead to further advancements in aquarium husbandry. While not in the lab he is the former president of one of the Nation's largest hobbyist clubs, the Wasatch Marine Aquarium Society (www.utahreefs.com). Adam has earned a BS in Marine Biology and an MS in the Natural Resource and Health fields. Adam can be found at adamblundell@hotmail.com.

References and Suggested Readings

1. How Stuff Works (2007) Website findings and summary, http://science.howstuffworks.com/question157.htm.
2. Ulrichs Fossil Gallery- Adam's favorite place for Eocene fish fossils http://www.ulrichsfossilgallery.com/index.html
3. U-Dig Fossils- Adam's favorite place for Cambrian Trilobite fossils http://www.u-digfossils.com/

ONLINE COURSES

Marine Aquarist Courses Schedule for 2008

By D. Wade Lehmann

Marine Aquarist Courses Online (MACO) will be offering a whole host of new educational courses for you starting in January 2008!

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Keywords (AdvancedAquarist.com Search Enabled): Chemistry, D. Wade Lehmann, MACO, Marine Aquarist Courses Online
Link to original article: http://www.advancedaquarist.com/2007/12/maco

Marine Aquarist Courses Online has three new courses on offer, starting in the first few weeks of January! Not sure what to ask for last minute for the holidays? Try a high-end aquarist based course to help progress you in your passion for the hobby!

All of our courses that are set to begin have a syllabus detailing the length of the course and a bio of the instructor. The MACO website has all of the details!

MACO is offering these courses starting soon!

January 7, 2008 - Reef Microbiology. This course is tailored to those who want to know more about the published science behind the true stability of the reef. The course will cover everything from the basics of microbial growth, to diversity, and nutrient fluxes! For more details, see the website: http://www.aquaristcourses.org/Reef Micro/

January 14, 2008 - Reef Chemistry. This course is set to start off at the very beginning so that anyone with a high school background in chemistry can follow along. It is geared to help you to understand everything from simple salt chemistry to more advanced buffering chemistry related to your marine aquarium. For more details: http://www.aquaristcourses.org/reefchem/

April 2008 - Fish Husbandry. Designed to start off with the basics of fish biology, this course soon dives into the details behind the maintenance and propagation of your favorite marine fish. For all of the details, see this link: http://www.aquaristcourses.org/Fish Husbandry/

MACO operates as a strictly online course. You are provided with access to the website that contains all of the material for your course. Each course has a private forum for its members as well as direct access to your instructor for questions. There is a chat session each week to cover new material and ask questions. Each course is different, depending on the instructor and the material to be covered. A six week course is only $75 for lifetime access to the material. More specific details are available for each course on the website.

Give the gift of knowledge this year! Sign yourself or a friend up for a genuine Marine Aquarist Courses Online class!

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See you in class!

WHAT IN NEPTUNE'S WORLD

What in Neptune's World?

By Terry Siegel

Guess the mystery coral.

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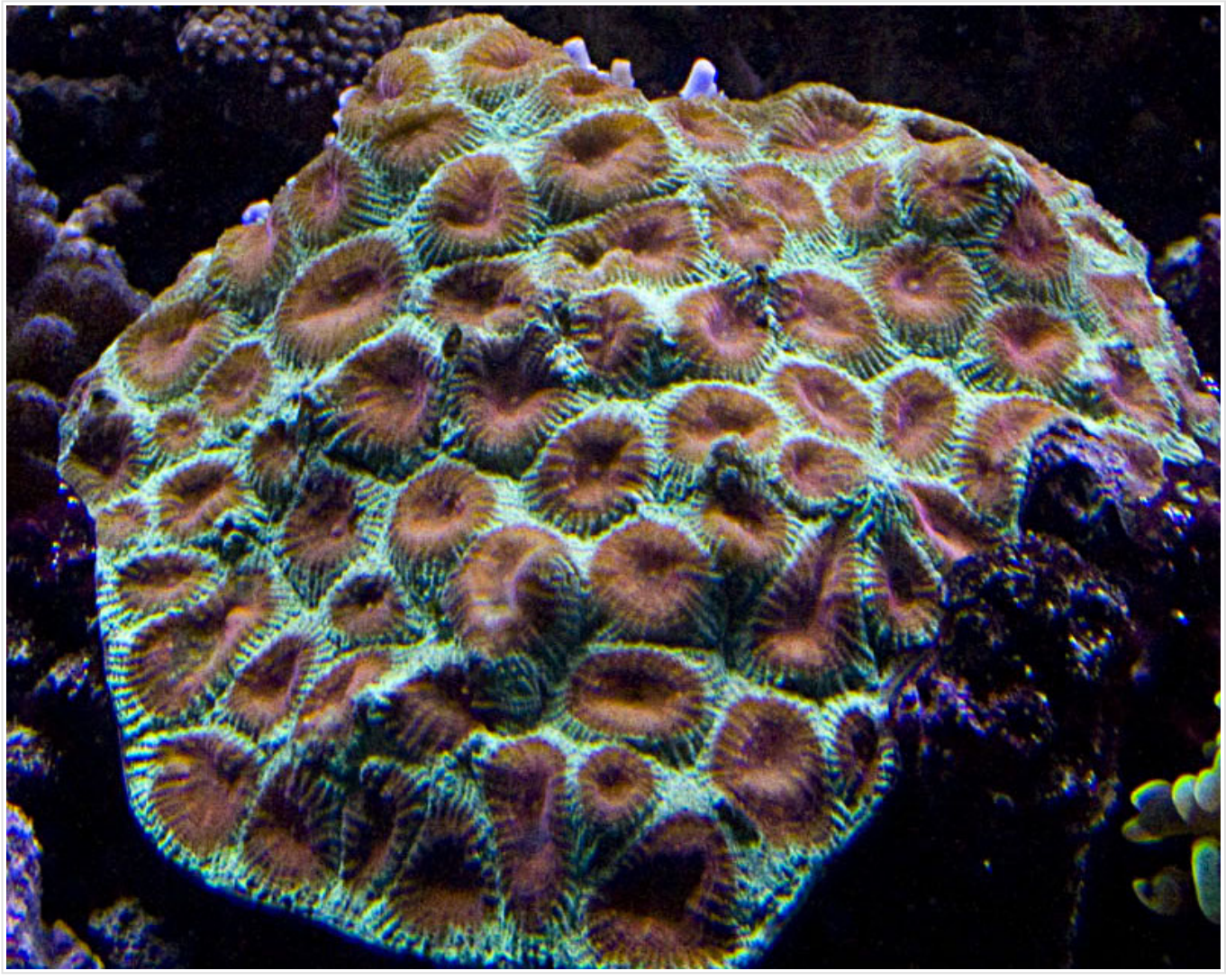
Keywords (AdvancedAquarist.com Search Enabled): Terry Siegel, What in Neptune's World?
Link to original article: http://www.advancedaquarist.com/2007/12/neptune

Welcome to **"What in Neptune's World"** - a column intended to explore the wonders of the coral reefs in an entertaining, interactive manner.

This month, we have a mystery coral seeking identification. Can you identify it?

Feel free to discuss the possibilities with other hobbyists in this thread in the Reefs.org's General Reef Discussion Forum.



PRODUCT REVIEW

Water Motion Devices - Sea Flo's Maxi-Jet Modification Kits

By Dana Riddle

This article will present objective performance evaluations of six water-moving devices, and can perhaps prevent your equipment graveyard from growing in size.

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Keywords (AdvancedAquarist.com Search Enabled): Dana Riddle, Flow, Powerhead, Product Review, Water Circulation
Link to original article: http://www.advancedaquarist.com/2007/12/review1

It has been almost a decade since I wrote a two-part article about water motion for "Aquarium Frontiers." Newly offered products, along with Jake Adam's series on water motion in *Advanced Aquarist Online*, prompted me to update these articles. This month, we'll examine some of the newer water motion devices on the market.

I won't go into much detail on why water movement is important in reef aquaria since the subject is one of much review and discussion. However, we should (and most likely do) understand that it *is* acritical link in successful maintenance of many invertebrates. In lieu of such a discussion, we'll look at the abilities of several devices in creating sufficient currents.

Ingenuity is no stranger to the reef aquarium hobby, where 'basement engineering' has created products to fill niche gaps overlooked by large manufacturers. Some rather clever devices to create water motion have recently appeared on the market. Just how good are they, are their claims factual, and are they worth your hard-earned cash? An experienced marine hobbyists probably has a 'bone yard' of discarded equipment that failed to perform adequately, and it is little secret that marketing hyperbole within the hobby sometimes exists. This article will present objective performance evaluations of six water-moving devices, and can perhaps prevent your equipment graveyard from growing in size.

Testing Protocol

All items, with the exception of the *prototype* Sea Flo kits, were obtained through normal retail channels, and all products were tested straight out of the box.

The discharge velocities of the modified powerheads were determined with an electronic water velocity meter (Marsh-McBirney FloMate 2000, see Figure 1). Output was calculated using the following formula: Flow = Velocity x Area, where Area is the size of the discharge (in square inches, using $\pi * r^2$ for round conduits) x Velocity (in inches per hour) ÷ 231 cubic inches per gallon = Flow, in gallons per hour (gph).

A different method had to be used for determining pump rates with the stock powerheads. The powerhead to be tested was partially immersed in a container filled with water, and the discharge penetrated the wall of this container. Water filled the reservoir as water was pumped to a graduated cylinder. The time required to fill the cylinder was recorded. The flow had to be corrected for nominal flow through the pump due to positive head pressure. This was determined by using the same setup just described, but with the pump off. Volume due to positive head pressure was subtracted from the total amount of water pumped to arrive at an estimated flow rate (See Figure 2).

In all cases, power consumption was monitored with a Kill-A-Watt electrical meter.

Water Motion Devices

Powerheads are small electric pumps that were originally designed to enhance the performance of undergravel filters. While undergravel filters have not found wide-spread acceptance

Figure 1. The testing setup for estimating flow volume of high discharge pumps, using the electronic water velocity meter. Flow velocity is measured and then used to calculate volume pumped.

among reef hobbyists, the powerhead is often the device of choice for creating water motion within 'home' aquaria.

Stock Powerheads

This month, we'll examine three popular powerheads. In order to establish a baseline for Sea Flo's modification kit available (and discussed later in this article), we will evaluate their performance straight out of the box.

Maxi-Jet™ powerheads, manufactured by Aquarium Systems, Inc., have been available to hobbyists for years. They have a reputation for durability and their epoxy-encased motors are approved by Underwriter's Laboratories. These features, combined with relatively low price, have made them favorites among hobbyists.

There are design differences among the Maxi-Jet powerheads. Motor size is a major factor, with the 1200 (obviously) being the more powerful. Each pump has a specifically designed impeller. The volutes (impeller chambers) are the same for the 600, 900 and 1200 models. (The Sea Flo modification kit is not recommended for the Maxi-Jet 400, therefore this powerhead was not tested).

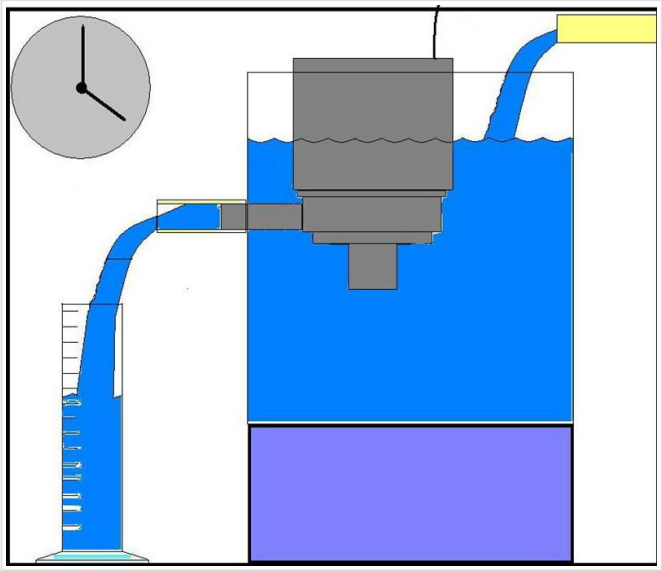


Figure 2. The method used in determining small diameter discharge flows.

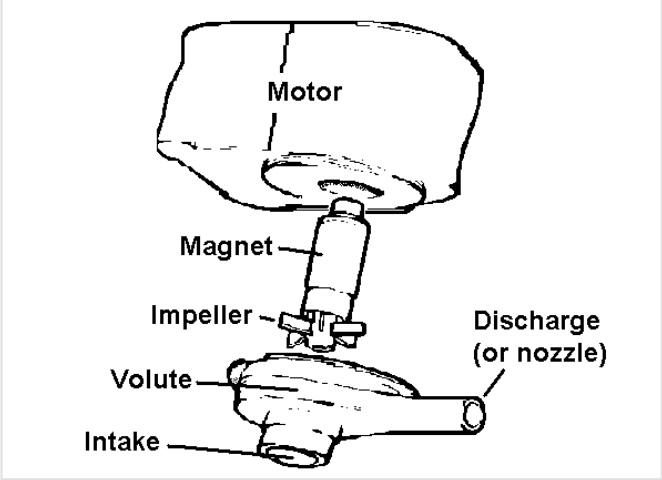


Figure 3. The anatomy of a typical powerhead.

Stock Maxi-Jet 600

The stock Maxi-Jet 600 used 6 watts and pumped 116 gallons per hour (using the setup shown in Figure 2).

Stock Maxi-Jet 900

Testing, using the method shown in Figure 2, determined the Maxi-Jet 900's flow rate to be ~198 gallons per hour. Power consumption is 7 watts under the conditions of testing.

Stock Maxi-Jet 1200

The Maxi-Jet 1200 powerhead is the most powerful pump in the Maxi-Jet series. Testing, using the method shown in Figure 2, determined the Maxi-Jet 1200's flow rate to be ~230 gallons per hour. Power consumption is 17-18 watts under the conditions of testing.

Maxi-Jet Modification Kits

In these cases, modifying a Maxi-Jet powerhead involves replacing the standard impeller/volute assembly with a small propeller and large intake/discharge shroud.

The shroud assembly will incorporate an important component - a propeller 'stop'. Since we're dealing with a small alternating current (AC) drive motor that has the ability to 'spin' in two directions, the 'stop' will ensure that the motor/propeller rotates in the correct direction (the powerheads' stock impellers do not care which way they turn - they will pump water while spinning in either direction). The principle for the 'stop' is simple - when the propeller spins the 'wrong' way, the propeller assembly moves forward, and the prop will make contact with the stop. Once the propeller's motion is arrested, it will begin to spin the correct way.

Stock impellers and volutes are generally not particularly efficient, and discharge sizes are small. On the other hand, a properly-sized propeller pump (the prop is designed to propel remote-control model boats) can move a lot of water.

Modification Kits by Sea Flo

Sea Flo has offered modification kits for a couple of years, and has just introduced injection-molded shrouds to replace their older machined shrouds.

Assembly is a simple as removing the shroud and impeller and replacing them with the Sea Flo propeller assembly and shroud - it is a snap.

Recommended Tools: None needed.

Assembly Time (first try): 5 *seconds*.

The newer version of the shroud is injection molded.

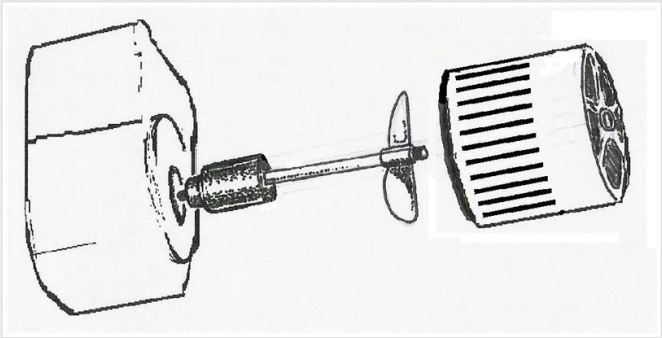


Figure 4. Exploded view of Sea Flo's modification for Maxi-Jet powerheads.

Figure 5. The 'original' machined shroud, holder and prop assembly from Sea Flo.

Figure 6. The same Sea Flo-modified Maxi-Jet shown in Figure 4, but after a year of service.

Sea Flo's Modification Kit for the Maxi-Jet 1200

Using the protocol described earlier (and pictured in Figure 1) the Sea Flo-modified Maxi-Jet's discharge velocity was measured at 3.51 feet per second. Using the area as mentioned above, this equates to 1,159 gallons per hour (gph). Power used was 14-15 watts.

Sea Flo's Modification Kit for the Maxi-Jet 900

The modified Maxi-Jet 900 modified pushed water at a velocity of 2.5 to 2.75 feet per second at the discharge. This equates to a flow rate of about 763 gph. Power used by the modified 900 jumped between 5 - 6 watts.

Sea Flo's Modification Kit for the Maxi-Jet 600

The modified Maxi-Jet 600 had a discharge velocity of ~2.4' second. Flow rate was calculated to be ~666 gph. Power used by the modified 600 was 4 watts.

Comments

Several considerations should be taken into account before purchasing a modification kit for any powerhead or pump. Price alone should not be the deciding factor. Consider these:

Low Noise

Noise can be a problem with any aquarium appliance, especially if the tank is in a bedroom. Tolerances of the replacement parts are critical in order to avoid distracting or annoying vibration. Sea Flo's replacement shroud has a snug fit. In addition, it utilizes the stock Maxi-Jet o-ring to dampen vibration.

A second source of noise can be the contact of the propeller and counter-rotation 'stop.' In cheap or poorly-designed modifications, this noise is an irritating 'rattling' noise, sometimes lasting for several seconds until the prop begins spinning in the

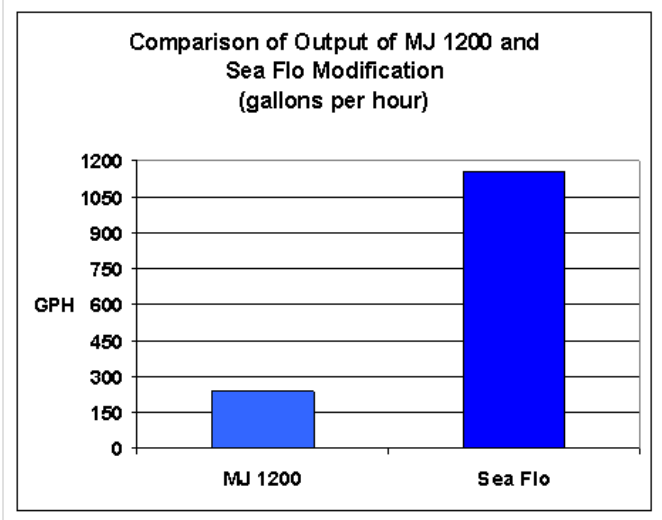


Figure 7. A comparison of water volume moved by a 'stock' and 'Sea Flo modified' Maxi-Jet 1200. Similar dramatic increases are also seen with the 600 and 900 mod kits.

proper direction (this can also damage the propeller). Sea Flo's design practically eliminates this source of noise.

Another concern about noise is the potential for air intake within the propeller chamber which would result in a 'slurping' sound. The Sea Flo design incorporates a shield to lessen the chance of air intake (the Sea Flo logo on the shroud should be facing upwards).

Size in Relation to Stock Maxi-Jet

Size matters. I suspect most reef hobbyists want an aquarium full of fishes and corals and not bulky powerheads. The Sea Flo units are very good at creating water motion, so fewer pumps are needed. In addition, they are not much larger than the stock powerheads.

If you find calcareous algae appealing as I do, these pumps can become covered with red and pink growths rather quickly and this goes a long ways in making the pumps blend in.

Durability

The eloquent beauty of these kits is that they have avoided design of a new pump and have opted to offer a modification to an existing (yet inexpensive and practically bullet-proof) powerhead.

Routine maintenance is easy, and is the same for any reef aquarium pump. The intakes on the shroud should be kept clear of fouling growths. Disassemble the pump and use an old toothbrush to clean the pieces of any bio-growths or calcium buildup (using vinegar if necessary to dissolve stubborn calcium 'flakes').

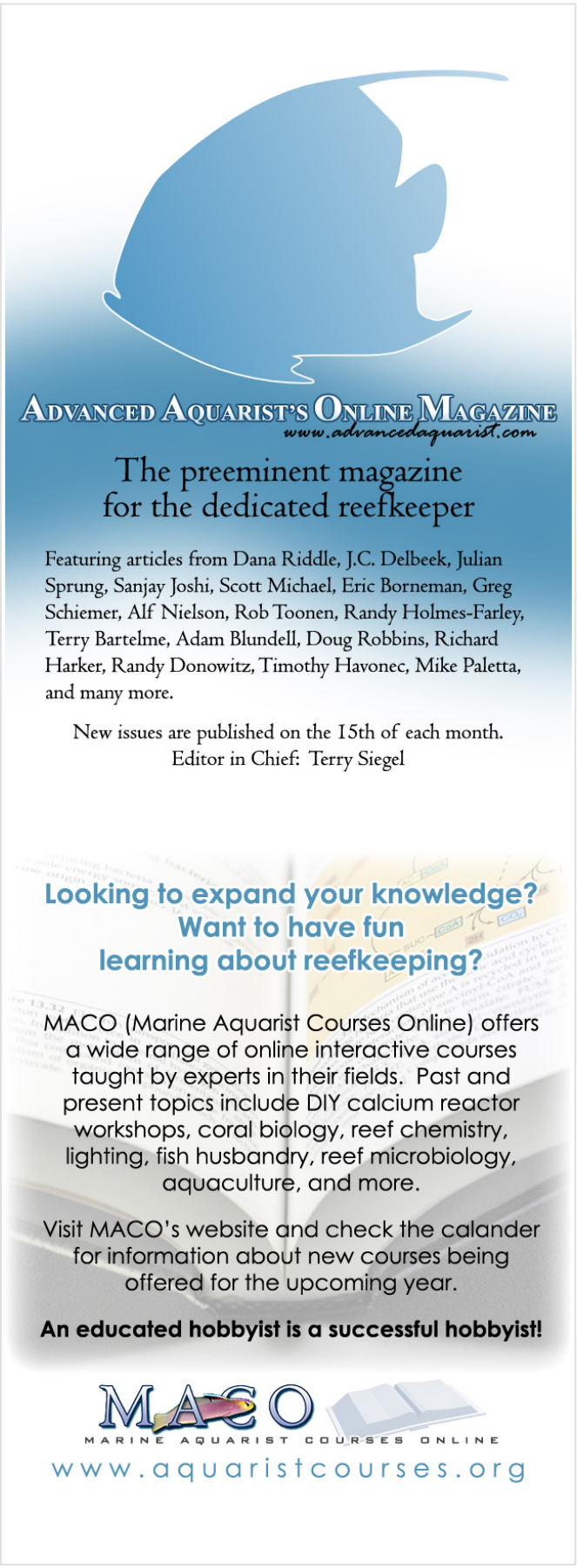
The only part recommended for routine replacement is a small thrust washer (it is designed to wear out thus saving the major portion of the propeller assembly for continued use). These are available from Sea Flo for less than $1 each (in a pack of 3). Although the washer is small in size, it plays a very important role in keeping the motive assembly serviceable. Make sure the modification kit you purchase has this important component.

We have used Sea Flo mods on wavemakers for over a year with no problems. The pumps and modification assemblies have suffered no failures, although very slight wear (scoring but not cracking) is seen on the propeller where it makes contact with the counter-rotation stop.

Sea Flo mods come with a one year warranty. Note that Sea Flo will not warranty their devices if used on a wavemaker.

Reliability

As noted, we have experienced no catastrophic failures during one year of operation. Just as important, however, is the reliability of the assembly on start-up and that it operates in the proper direction quickly and without significant noise. Our 3 units have operated flawlessly.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Power Consumption

Power consumption actually drops when the Maxi-Jets are modified with the Sea Flo kits, and they move much more water. See Figure 8 for a comparison.

Ordering

To our knowledge, Sea Flo offers their products only through their secure website. See: www.Sea Flo.com. Our experiences with Sea Flo have been very positive. Shipping is very prompt with orders arriving in less than a week.

Comments

Based on our experiences with medium-sized stony coral aquaria, we recommend 1 Sea Flo modified powerhead for every 18 inches of aquarium length (with a minimum of two for aquaria exceeding 30 gallons). These modified pumps have applications for smaller reef aquaria, but we have not tested them on such. Be aware that two of these devices in a 40-gallon aquarium can move sand beds (even coarse sand) around (this is, of course, natural and is seen on real reefs even on calm days). Proceed cautiously - it is possible to 'blow' corals' soft tissues off the skeleton if they are placed too close to a discharge. And while on this point - avoid the temptation to think more flow is *always* better.

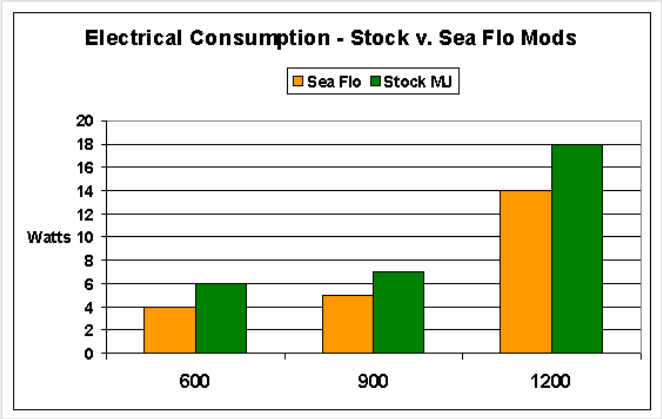

Figure 8. Power usage of stock and modified powerheads.

Soft coral tanks and fish-only aquaria could perhaps use fewer units.

As always, standard safety precautions should be followed to guard against injury, (Marineland's recommendations are listed on the inside front cover of the Maxi-Jet owner's manual).

There are several Maxi-Jet mods now available, as well as other pre-assembled propeller pumps (such as Koralia from Italy). I am in the process of testing these and can report varying degrees of success (or failures). If all goes well, I will report on those units that survived the testing period (6-8 months).

In Closing

The Marine Aquarium Conference of North America (MACNA) will be hosted by the Atlanta Reef Club in September 2008. Don't miss out on this great experience! See www.masna.org for details.

Please contact me at RiddleLabs@aol.com if you have any questions.

Acknowledgement

Many thanks to Joe Yaiullo of Atlantis Marine World (www.atlantismarineworld.com) for the link to Sea Flo.

PRODUCT REVIEW

The 'Frag-Mag' Plus Magnetic Powerhead Holders and The Rotation Bracket for Modified Powerheads

By Dana Riddle

The powerhead holding magnets are not toys! Though seemingly innocuous, these powerhead-attachment products should be handled with care and should definitely be kept away from children (and careless adults).

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Keywords (AdvancedAquarist.com Search Enabled): Dana Riddle, Flow, Product Review, Water Circulation, Magnets, Powerhead
Link to original article: http://www.advancedaquarist.com/2007/12/review2

Some simple yet eloquent products have recently become available to reef hobbyists and it makes me wonder why someone didn't think of these solutions a long time ago. This month's Product Review will examine the application of simple magnets and how these products can benefit both hobbyists and captive livestock.

Note: This article has been in preparation for over one year, and originally contained references to products no longer available. The two 'magnetic' products reviewed here have been around for a while and have performed well. Algae Free's 'Rotation Bracket' for modified Maxi-Jet powerheads is relatively new, so preliminary observations are presented below.

Frag-Mag

We had so many unanswered questions in the pioneering days of the reef hobby in the United States. One major problem was holding corals in place until they could grow and attach on their own to the substrate. It seemed everyone had a favorite 'adhesive' ranging from expensive 'industrial' underwater epoxies (with a cure time of 24 hours) to rubber bands, toothpicks, and even chewed bubble gum (!). Years later, while managing a large-scale propagation facility, we relied upon eggcrate and plastic flower picks to hold coral fragments and broodstock in place. Of course, we now have fast-setting 'reef safe' epoxy and various 'super glues'. These work fine but have a disadvantage of pretty much permanently mounting a specimen in place. In addition, mounting large coral specimens in an existing aquarium with any of the various glues can be a challenge and especially so to sloped or vertical surfaces. For researchers, there exists a paradox of keeping a specimen in place yet having the luxury of easy removal for various testing procedures.

Aqua Mags (www.aqua-mags.com) has introduced a clever solution for these situations. Their 'magnetic coral attachment system' includes two reef-safe magnets, one of which is coated with a fine, inert black 'gravel'. Fragments or colonies are adhered with any of your choice of available glues, and once the glue has cured, the piece and its magnetic base are held in place by the 'pull' of the other magnet. Mounting corals on the bottom, side walls or back of an aquarium becomes easy and opens the possibility of some unique aquascaping arrangements (See Figures 1 and 2). I use Frag-Mags to hold specimens temporarily in place while performing photosynthesis experiments with a PAM fluorometer, fluorescence/reflectance analyses as well as positioning corals for photographic purposes. The ability to incrementally move a particular coral during its 'light adaptation' period after transfer to a new home should also be of benefit.

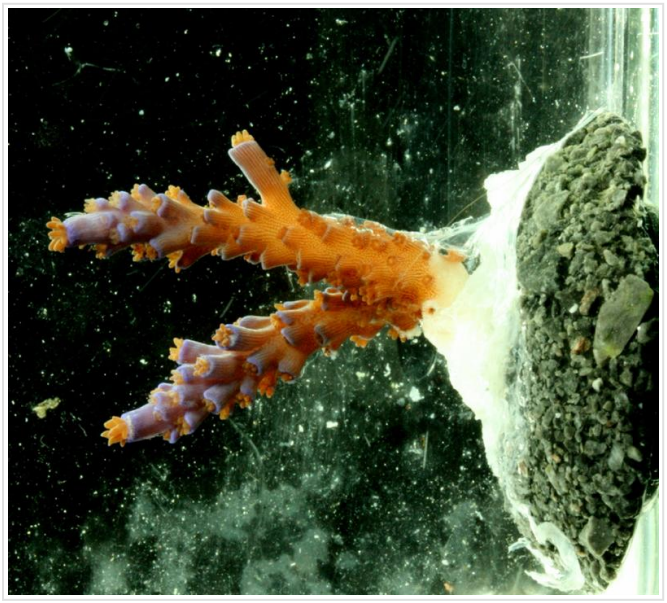

Figure 1. An Acropora fragment is held to the wall of an aquarium by a Frag-Mag.

Originally available in 3 sizes, Aqua Mags now offers a 'one-size-fits-all' approach and offers 'large' magnets that are sufficient to hold most fragments and many colonies in place on glass or acrylic up to ¾" thick. The black sand-encrusted base to which the coral fragment is glued is ~1" in diameter. Gluing one magnet to eggcrate while leaving the other base magnet and coral held in check by magnetism is also an option (especially viable if you have a lot of water circulation).

Advertised prices at the time of this writing are $5.95 for each Frag Mag set or three sets for $16.95 (plus shipping and any applicable taxes). Volume discounts are available for clubs.

Sure Grip Magnetic Powerhead Holder for Stock Powerheads

These devices (manufactured by Algae Free, LLC - perhaps best known for their magnetic aquarium cleaners) provide an answer to the problem of errant powerheads.

Fortunate are those reefkeepers who have *not* experienced the aggravation and damages caused by failure of a powerhead's suction cups or support.

The Sure Grip holders are available to support Maxi-Jet, Seio and Tunze powerheads. Model '50' and the appropriate attachment (included) work with all Maxi-Jets (400-1200 series, and glass thickness to ½"), Seio powerheads M620 and M820 (to glass thickness of ½") and Tunze 'Stream' pumps (all models, and glass thickness to 3/8"). The Sure Grip 100 magnets work with, in addition to those listed above), Seio 1100 and 1500 series powerheads and glass thickness up to ¾". The Model 50's dimensions are approximately 1-5/8" X 3-1/8" X ¾".

With a little ingenuity, it is possible to use these magnets with other powerheads by simply attaching them to the magnets with 'aquarium grade' silicone. By the same token, it would be possible to mount *really* large coral heads on aquarium sides or backs.

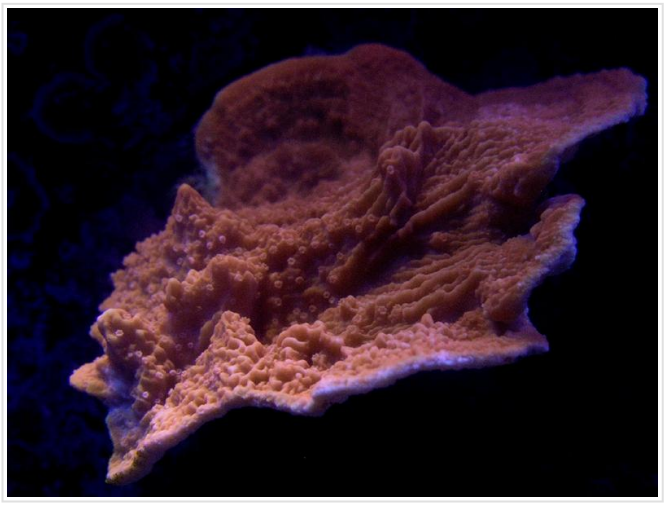

Figure 2. Using a Frag-Mag to attach a coral to the side of an aquarium can result in a dramatic effect.

Algae Free states they use powerful neodymium magnets, and these are encased in a thick plastic capsule to ensure worry-free service. Both the '50' and '100' powerhead holders have a 1 year warranty. The smaller magnetic set retails for about $24.95, and the Model 100 is $34.95 or so.

Sure Grip Magnetic Holder and Rotation Bracket

(This system is recommended for modified powerheads)

This neat little adapter allows use of the Sure Grip magnets and certain modified powerheads (including Maxi-Jets).

The rotation brackets work well and fit very snugly into the channel of the powerhead. I haven't had these in service long enough to determine how often the entire bracket assembly

Figure 3. The Sure Grip powerhead attachment consists of two magnets (such as the one pictured above) and a special adapter for select powerheads (see text).

Figure 4. Algae Free's attachment set up for an unmodified Maxi-Jet pump. Different couplers allow use on certain Seio and Tunze powerheads.

should be cleaned. I imagine that coralline algae will eventually cement the channel bracket and ball/socket joint firmly together unless I clean these on a regular basis.

Algae Free advises me that they anticipate offering the Rotation Bracket as part of the Sure Grip Magnet system in the near future. At present, the brackets are only available as part of their Sure Flow 1600 modification kits (Note: The Sure Flow modification kits for Maxi-Jet powerheads are presently under evaluation. I will report on these in a few months if they pass muster).

Figure 5. One Sure Grip magnet set can hold two modified powerheads. The rotation brackets' articulated joints allow aiming of individual powerheads.

COMMENTS

The powerhead holding magnets are not toys! Though seemingly innocuous, these powerhead-attachment products should be handled with care and should definitely be kept away from children (and careless adults - I can attest that getting pinched by two powerful magnets slamming together is not fun. I escaped with only a 'blood blister' but imagine that these could break small bones). Neodymium magnets are so powerful that they can erase credit card magnetic strips, hard drives and even affect pacemakers if allowed to get too close.

Smaller magnets (such as those inside the Aqua Mags) could present a swallowing/choking hazard and potential gastro-intestinal blockages.

But let's not get carried away - these items are perfectly safe when reasonable care is exercised.

All referenced products managed to hold modified powerheads or coral fragments perfectly in place during the 6.7 earthquake (followed moments later by a 6.0 aftershock) that shook the Big island of Hawaii in October 2006. There was lots of water on the floor, but powerheads and magnetically-held corals stayed put.

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ONLINE NEWS

Reefs in the News

From Online News Sources

Media coverage of the state of our world's reefs, interesting information, and other marine-related news.

Published December 2007, Advanced Aquarist's Online Magazine.
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Link to original article: http://www.advancedaquarist.com/marinenews

Researchers praise UC Santa Cruz's marine campus expansion as good for science (Santa Cruz Sentinel)

National Marine Sanctuary in the News
December 15, 2007 10:03 AM

SANTA CRUZ -- The oceanfront labs that have generated three decades worth of marine science -- bringing to light the remarkable 5,000-foot ocean dives of the elephant seal and inspiring the state's newest system of ocean reserves -- will get a boost with expansion plans approved this week.

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http://us.rd.yahoo.com/dailynews/rss/search/%22National+Marine+Sanctuary%22/SIG=12bdqmm1q/*http%3A//www.santacruzsentinel.com/story.php?storySection=Local&sid=51600

Global Warming Is Destroying Coral Reefs, Major Study Warns

ScienceDaily: Coral Reef News
December 15, 2007 01:00 AM

Major new research indicates that coral reefs won't survive the rapid increases in global temperatures and atmospheric carbon dioxide forecast by the IPCC. The livelihoods of 100 million people living along the coasts of tropical developing countries will be among the first casualties. Marine scientists argue for drastic action by world leaders on carbon dioxide emissions. Immediate use of proven policy and management tools to address over-fishing, pollution and unsustainable coastal development is critical to saving coral reefs.

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Source:
http://www.sciencedaily.com/releases/2007/12/071213152600.htm

Reef survival hinges on emissions cuts, green group says (ABC via Yahoo!7 News)

Yahoo! Coral Reefs News
December 14, 2007 10:14 PM

The Queensland Conservation Council (QCC) says a new study predicting global warning will decimate the world's coral reef systems within 30 years, including Queensland's Great Barrier Reef, confirms its worst fears.

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=11hogjf45/*http%3A//au.news.yahoo.com/071214/21/159ts.html

'It is too late to save Great Barrier Reef' (New Kerala)

Yahoo! Coral Reefs News
December 14, 2007 03:42 PM

Melbourne, Dec 14 : It is probably too late to save the Great Barrier Reef and other coral reefs from global warming, warns an analysis by leading marine scientists.

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Source:
http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=11sdh4taq/*http%3A//www.newkerala.com/one.php?action=fullnews&id=3477

Hawaii Superferry's arrival stays calm (Honolulu Advertiser)

National Marine Sanctuary in the News
December 14, 2007 12:20 PM

The 350-foot catamaran sailed into Kahului Harbor at 10:05 a.m. under a light drizzle and the protection of federal, state and county law enforcement agencies, but protests were limited to sign-holding and shouts of "Go home!" and "Give us back our harbor!"

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http://us.rd.yahoo.com/dailynews/rss/search/%22National+Marine+Sanctuary%22/SIG=12h0punnj/*http%3A//the.honoluluadvertiser.com/article/2007/Dec/14/ln/hawaii712140375.html

Some queasy, some easy in rough seas (Honolulu Advertiser)

National Marine Sanctuary in the News
December 14, 2007 12:20 PM

ABOARD THE HAWAII SUPERFERRY â€" Maccine Carter spent more than three hours vomiting aboard the Hawaii Superferry yesterday on the final day of her Hawai'i vacation and still enjoyed her trip from O'ahu to Maui.

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Reef's future 'not hopeless' (Adelaide Now)

Yahoo! Coral Reefs News
December 14, 2007 05:15 AM

THERE is still hope for the Great Barrier Reef, despite a report which says the world's coral reefs may be doomed, Environment Minister Peter Garrett says.

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=12p9g7aco/*http%3A//www.news.com.au/adelaidenow/story/0,22606,22923948-911,00.html?from=public_rss

ARMC, NOAA unveil new hyperbaric chamber (Alpena News)

National Marine Sanctuary in the News
December 14, 2007 04:00 AM

Alpena Regional Medical Center officially opened its Center for Wound Healing and Hyperbaric Medicine Thursday afternoon, which officials said is good news for people with certain types of wounds and divers.

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http://us.rd.yahoo.com/dailynews/rss/search/%22National+Marine+Sanctuary%22/SIG=124vd20mb/*http%3A//www.thealpenanews.com/stories/articles.asp?articleID=6144

Indonesia Gets US$33.3 MLN For Coral Reef Management (Asia Pulse via Yahoo!7 News)

Yahoo! Coral Reefs News
December 14, 2007 02:13 AM

Indonesia has received funds amounting to US433.3 million for coral reef management under the Coral Triangle Initiative (CTI), an official said.

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=11gnke00c/*http%3A//au.news.yahoo.com/071214/3/159j5.html

INDONESIA GETS US$33.3 MLN FOR CORAL REEF MANAGEMENT (Asia Pulse via Yahoo!7 Finance)

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Give a Little (Santa Barbara Independent)

National Marine Sanctuary in the News
December 13, 2007 10:59 PM

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Great Barrier Reef doomed (Herald Sun)

Yahoo! Coral Reefs News
December 13, 2007 10:52 PM

THE Great Barrier Reef and other coral reefs will be annihilated by global warming, even if the world's governments slash greenhouse gas emissions, scientists say.

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Great Barrier Reef doomed (Herald Sun)

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New climate change warnings say coral reefs doomed in 30 years (EARTHtimes.org)

Yahoo! Coral Reefs News
December 13, 2007 10:25 PM

Sydney - A climate change study to be released Friday predicts the world's coral reef systems, including Australia's Great Barrier Reef, could start collapsing within 30 years if the effects of global warming are not reversed. The Great Barrier Reef,...

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=11nfta04s/*http%3A//www.earthtimes.org/articles/show/158384.html

Coral Reefs Worldwide Imperiled by Climate Change, Study Says (Bloomberg.com)

Yahoo! Coral Reefs News
December 13, 2007 09:14 PM

Dec. 13 (Bloomberg) -- Global climate change may push the Great Barrier Reef and other coral colonies past a fatal tipping point, imperiling fisheries and tourism-dependent economies of many developing nations, a study said.

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Barrier Reef could be gone within 30 years: study (ABC via Yahoo!7 News)

Yahoo! Coral Reefs News
December 13, 2007 09:04 PM

A new study predicts the world's coral reef systems, including Queensland's Great Barrier Reef, could collapse within 30 years if the effects of global warming are not reversed.

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Scientists: Global warming could kill coral reefs by 2050 (USA Today)

Yahoo! Coral Reefs News
December 13, 2007 08:22 PM

Rising carbon emissions might kill off the ocean's coral reefs by 2050, scientists warn in today's edition of the journal Science.

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=12t9kdhhq/*http%3A//www.usatoday.com/weather/climate/globalwarming/2007-12-13-coral-reefs_N.htm?csp=34

New Science Paper Says Carbon Emissions Threaten Coral Reefs

NOAA News Releases
December 13, 2007 07:59 PM

NOAA Coral Reef Watch coordinator Mark Eakin, and 17 fellow coral scientists from around the globe say corals could begin to disappear in 50 to 75 years due to steadily warming temperatures and increasing ocean acidification caused by carbon dioxide emissions.

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Source:
http://www.noaanews.noaa.gov/stories2007/20071213_carboncoral.html

Coral reefs threatened by rising CO2 levels: study (TODAYonline)

Yahoo! Coral Reefs News
December 13, 2007 07:52 PM

A diver examines a coral reef. The survival of the world's coral reefs will be seriously threatened by 2050 if atmospheric levels of carbon dioxide (CO2) and the acidity of ocean waters continue to rise at the present rate, said a study published Thursday.

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*http%3A//www.todayonline.com/articles/227418.asp

2007: A Top Ten Year

NOAA Government News Releases
December 13, 2007 07:38 PM

This year will likely be the eighth warmest on record for the U.S. and the fifth warmest for the globe according to preliminary data from NOAAâ€™s National Climatic Data Center.

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Source:
http://www.noaanews.noaa.gov/stories2007/20071213_climateupdate.html

Coral reefs threatened by rising CO2 levels: study (AFP via Yahoo! News)

Yahoo! Coral Reefs News
December 13, 2007 07:35 PM

The survival of the world's coral reefs will be seriously threatened by 2050 if atmospheric levels of carbon dioxide (CO2) and the acidity of ocean waters continue to rise at the present rate, said a study published Thursday.

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*http%3A//news.yahoo.com/s/afp/20071213/sc_afp/usenvironmentpollutionoceans_071213193139

Acid seas huge threat to coral reefs (Daily Telegraph)

Yahoo! Coral Reefs News
December 13, 2007 07:30 PM

A STUDY handed down by 17 world renown marine scientists belonging to the Coral Reef Targeted Research and Capacity Building for Management Program, says that the Great Barrier Reef is one of many reefs around the world in serious trouble.

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0,22049,22922998-5001028,00.html?from=public_rss

Acid seas huge threat to coral reefs (Adelaide Now)

Yahoo! Coral Reefs News
December 13, 2007 07:30 PM

A STUDY handed down by 17 world renown marine scientists belonging to the Coral Reef Targeted Research and Capacity Building for Management Program, says that the Great Barrier Reef is one of many reefs around the world in serious trouble.

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0,22606,22922998-5005962,00.html?from=public_rss

Acid seas huge threat to coral reefs (Perth Now)

Yahoo! Coral Reefs News
December 13, 2007 07:30 PM

A STUDY handed down by 17 world renown marine scientists belonging to the Coral Reef Targeted Research and Capacity Building for Management Program, says that the Great Barrier Reef is one of many reefs around the world in serious trouble.

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Acid seas huge threat to coral reefs-study (AlertNet)

Yahoo! Coral Reefs News
December 13, 2007 07:12 PM

Source: Reuters By Jim Loney MIAMI, Dec 13 (Reuters) - In less than 50 years, oceans may be too acidic for coral reefs to grow because of carbon emissions from the burning of fossil fuels by humans, ...

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=11q0auc4r/*http%3A//www.alertnet.org/thenews/newsdesk/N12186124.htm

Increasing Acid Could Kill Most Coral by 2050 (LiveScience.com via Yahoo! News)

Yahoo! Coral Reefs News
December 13, 2007 07:10 PM

SAN FRANCISCO â€" The worldâ€™s coral reefs face almost certain death as increasing amounts of carbon dioxide in the atmosphere are absorbed by the oceans, acidifying the water in which corals live, a new study warns. In the past few decades, corals have come under increasing pressure from warming ocean waters, overfishing and disease. A recent study found corals in Pacific ocean were disappearing ...

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It's official: The carbon crisis is lethal for coral reefs (EurekAlert!)

Yahoo! Coral Reefs News
December 13, 2007 07:05 PM

The largest living structures on Earth and the millions of livelihoods which depend upon them are at risk, the most definitive review yet of the impact of rising carbon emissions on coral reefs has concluded.

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http://us.rd.yahoo.com/dailynews/rss/search/coral+reef/SIG=1252ra0f0/*http%3A//www.eurekalert.org/pub_releases/2007-12/crtr-iot121007.php

Great Barrier Reef is 'doomed' (Adelaide Now)

Yahoo! Coral Reefs News
December 13, 2007 07:03 PM

IT'S probably too late to save the Great Barrier Reef and other coral reefs from destruction by global warming, a group of leading marine scientists say.

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Great Barrier Reef is 'doomed' (News Interactive)

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IT'S probably too late to save the Great Barrier Reef and other coral reefs from destruction by global warming, a group of leading marine scientists say.

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The Two Part Solution is a method of adding calcium, alkalinity and magnesium to your reef aquarium. What's unique about this solution is many of the items used are household items or just bulk supplies of the very same products you are buying two cups of for $20 just because it has a fancy package. It has been time tested by thousands of aquarists and proven to not only be incredibly effective and easy to use but also extremely affordable. There is simply no other balanced calcium, alkalinity and magnesium solution out there that is so ridiculously cheap and has no expensive and intimidating equipment to buy.

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AquaC, Inc. was founded in 1998 as a small one-man operation that focused on providing exceptional products and stellar customer service. Since that time, the company has rapidly developed into one of the fastest growing marine filtration manufacturer's in the industry. Although we now offer a variety of product lines and manufacture thousands of units each year, our focus remains the same - quality products and top-notch customer service.

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Reef Nutrition Marine Live Feeds are produced by Reed Mariculture, the world's largest producer of marine microalgae concentrates. We supply algal feeds and zooplankton to universities, marine ornamental growers, and over 500 fish, shrimp, and shellfish hatcheries in 70+ countries around the world.

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Sunlight Supply Inc. is a manufacturer and importer of High Intensity Discharge (H.I.D.) and fluorescent lighting fixtures. We specialize in fixtures with applications in the hobby & commercial horticulture and reef tank aquarium industries. Sunlight Supply Inc. is a recognized and respected leading brand in the marketplace.

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